Marriages, Couples, and the Making of Mathematical Careers

Other

Marriages, Couples, and the Making of Mathematical Careers

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By considering instances of mathematicians who have worked closely with a spouse or partner, we offer historical perspectives on gender and work-life balance in mathematical research. We aim to use history to open space for re-imagining how collaboration, home-life, and labour fit together in the mathematical community today.

The home life of mathematics

Though mathematicians are often imagined as the quintessential solitary researchers, many have managed the daily routines of a mathematical career through partnership with a spouse who was intimately involved in their working life. Whilst marriage is certainly not the only, nor even the most common form that collaboration can take, it does offer an especially clear window on the unstable boundaries dividing labour into the intellectual and the domestic, the masculinised and the feminised, or the credited and the unacknowledged. As historians of mathematics, we suggest that by looking at how such categories were made, sustained, and changed in the past, we can not only deepen our historical understanding but also support more equitable mathematical practice in the present.

A focus on collaboration is part of a broader trend in history of science scholarship which has sought to unravel the myth of the 'lone genius', that heroic, solitary — and usually white, male, European — individual who is celebrated as the sole mind behind innumerable discoveries. This is perhaps best encapsulated by Isaac Newton's so-called *annus mirabilis* or 'Year of Wonders', a period of intense productivity when he escaped from Cambridge to Woolsthorpe Manor during the Great Plague of 1665–6; it was here that he seemingly 'invented' calculus out of nothing, revolutionising physics and mathematics. However, this narrative sidelines and undervalues the work that had already been done by mathematicians such as Pierre de Fermat, René Descartes, or Isaac Barrow on the problems of finding tangents and quadratures. Futhermore it renders invisible the extensive network of mathematicians who corresponded with each other on such topics, and of which Newton was a part. These written exchanges could be facilitated by formal bodies, such as learned academies and societies, but just as often were part of personal correspondence.

Thus our need to understand individual achievements in their wider intellectual and social context should not end at the boundary of officially recognised scholarly activity. The importance of scientific knowledge production in the 'domestic sphere' — that is at home, in private, or through informal exchange — has been well treated in literature on women in science. Until very recently women were unable to access the 'public' institutions which have long been privileged as knowledge-making spaces: universities, scientific academies, or research laboratories. Only by looking beyond these spaces have historians recognised the many creative ways women found to participate in scientific endeavours. Ineligible to study at the École Polytechnique in 1794, Sophie Germain entered into correspondence with Joseph-Louis Lagrange under the pseudonym Antoine-Auguste Le Blanc in order to get a copy of his lecture notes to study. Germain subsequently situated herself within a wider network of mathematical correspondents, perhaps most notably Carl Friedrich Gauss, and although she never directly published her work on Fermat's Last Theorem it was certainly read by Adrien-Marie Legendre who explicitly attributed a result to her in a memoir he presented to the *Académie des Sciences* in 1823 [2].

To bring the collaboration that takes place *within a household* to the foreground is then to unite these two currents in historical research, viewing collaboration and domesticity together. Historians of science have studied collaboration between married couples and other domestic partners, but so far we lack a study dedicated to collaborative couples in the history of mathematics. Collaborative couples in mathematics, however, present a special case in that so many kinds of mathematical practice are

Figure 1: Participants at the 1950 ICM. HUPSF International Congress of Math (BP1), Harvard University Archives.

possible without any sort of specialised equipment or facilities; there need be no difference between domestic space and the space of mathematical research. At times this fact has made mathematical work more accessible to women than other forms of scientific contribution, though that access has not meant their work was regarded in equal or ungendered terms. Rather instances of mathematical collaborative couples provide us a window on the complex gendered terrain of collaboration within a marriage.

At home, the lines between the kinds of labour a couple divvied up among themselves and those which they delegated to servants, secretaries, or extended family, position mathematicians in a wider structure of class and familial relations. For Dorothy Vaughan, the transition from school teacher to professional mathematician was contingent on her wider family providing childcare when she moved 137 miles away from her children to take up a job at Langley Research Centre, part of the United States National Advisory Committee for Aeronautics, in 1943. Vaughan's life and career is treated in Margot Lee Shetterley's book *Hidden Figures*, and the 2016 film of the same name. Living through the global pandemic in 2020 has certainly underscored the relationship between gender, class, and caring responsibilities, with the greatest reduction in time available for research being felt by female scientists with young dependents [5].

Couples and careers

We have so far emphasised domestic settings, but a couple's collaborative activity is certainly not limited to the home. Many couples have worked together to construct a shared network of mathematical acquaintances via letter writing or, more recently, through attendance at international meetings, congresses, and conferences — sites at which it can be impossible to separate mathematical from purely social exchange. Officially, women often attended such conferences as spouses and therefore do not turn up on the list of participants, but nevertheless engaged with the mathematical community in a meaningful way. Indeed the Women's Committee of the 1950 International Congress of Mathematicians in Cambridge, Massachusetts was made up of the wives of the organisers, and oversaw some of the social activities at the conference which were vital to international exchange. Thus women, including many who were not mathematicians themselves, helped sustain the professional networks that made international mathematical research possible.

Exclusion from formal membership in such networks, however, was often one of the tactics used by elite scientists to contain the perceived threat to their professional status represented by rising gender, sexual, or racial diversity in science. Heterosexual couples who were also colleagues can serve as useful comparative illustrations of the differential obstacles women faced, even while their marriages also sometimes offered strategies for circumventing those obstacles. The mathematical logician, psychologist, and activist Christine Ladd-Franklin completed the requirements for a PhD in Mathematics at Johns Hopkins University in 1882. But the university — employing another increasingly common tactic for hindering women's scientific activity — drew the line at actually awarding degrees to the few women it grudgingly permitted to become students. Her husband Fabian Franklin's scientific career, however, offered them stability and even the opportunity for them both to spend

a sabbatical year in Europe. Ladd-Franklin spent this time working in the labs of Georg Müller in Göttingen and Hermann von Helmholtz in Berlin. Franklin left academia for journalism in 1895, whereas Ladd-Franklin remained an active, highly regarded scholar into old age, but she never had access to the academic positions and resources he had had at his disposal. In 1926 she finally received the PhD she had earned 44 years earlier.

The so-called 'two-body problem', where both partners are early career researchers on the academic job market, continues to create tension for those hoping for work-life balance. The likelihood of both partners successfully finding work in the same geographic location is often decreased further when their research is in the same or very similar fields. According to the documentary film by George Csicsery, *Secrets of the Surface: The Mathematical Vision of Maryam Mirzakhani*, such considerations even influenced the career trajectory of Fields Medallist Mirzakhani, who was married to mathematician Jan Vondrák.

In the case of couples who have collaborated even more closely, working together on the finest details of their research, the distinction between cooperation and exploitation can be slippery. A challenge for historical interpretation arises in cases of joint work appearing under a single (usually male) name, an arrangement that may or may not have been mutually agreeable depending on each partner's interpretation of their own role. The most well-known case in mathematics is that of Grace Chisholm Young and William Henry Young. In 1895, aged 27, Chisholm Young was awarded her doctorate in mathematics at Göttingen University, and between then and 1929 the Youngs published over 200 mathematical papers. They collaborated closely throughout this time, however only 13 papers were published jointly, and only 18 were published under Chisholm Young's name alone. At a time when there were very few paid positions for women to teach or research mathematics (and even fewer for married women), it seems that it was more beneficial economically for them as a household to attribute the work solely to William Young. The terms of a collaboration, however, do not always remain amiable. When Mileva Marić threatened her ex-husband Albert Einstein with revealing the extent of their collaboration on work published under his name, his chilling response was to point out that no one would believe her:

> "You made me laugh when you began to threaten me with your memories . . . When a person is completely insignificant, there is nothing else to tell such a person but to remain modest and silent. This is what I advise you to do." [1, p. 241].

The exploitation of collaborators arising from an unequal power dynamic is still extremely relevant today and of course not confined to partnerships. PhD students and post-doctoral researchers face chronic job instability whilst being reliant on the support and collaboration of supervisors when preparing their work for publication. This is further complicated by the widespread sexual harassment which persists at universities in the UK. The 2018 NUS Report on staff-student sexual misconduct in higher education found that 41% of the 1535 students who responded to the survey had experienced sexual misconduct from staff, with postgraduates more likely to have experienced misconduct than undergraduates. Students were also more likely to have experienced sexual misconduct from university staff if they were women, and more again if they identified as gay, queer, or bisexual. [6, pp. 8–9].

Given that the division of labour within a couple is so often governed by prevailing inequities in the society in which they live, it is no surprise that male mathematicians have tended to more easily receive credit, compensation, and prestige than their female partners. By favouring William Henry Young's name, the Youngs adopted a highly successful strategy in a publishing landscape that was not of their own design.

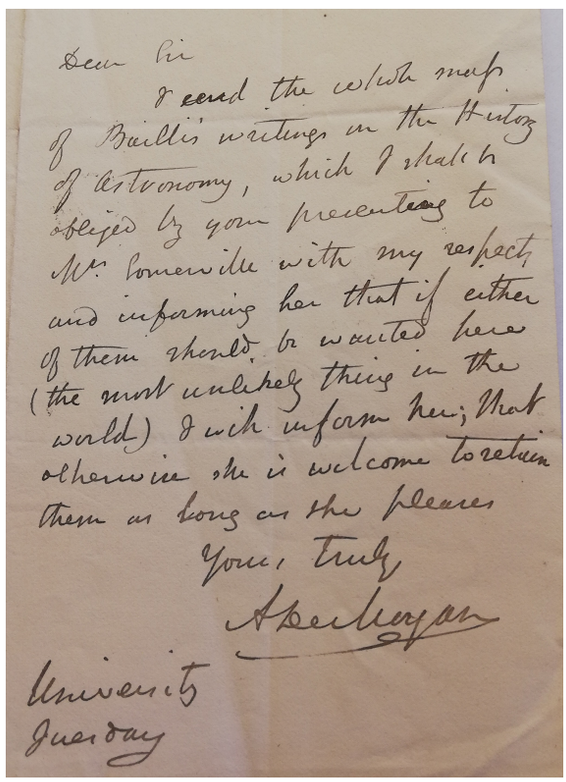
But we also find examples of cooperative efforts to prioritise a woman's mathematical career, such as the case of Mary Somerville (née Fairfax) and her husband Dr. William Somerville. Ineligible for a university education or for election to a learned society as a woman, Somerville's access to the mathematical knowledge circulating in these spaces was highly restricted. As a 'clubbable' gentlemen with interests in natural history and mineralogy, her husband, on the other hand, was elected a member of numerous learned societies including the prestigious Royal Society of London. He actively supported Somerville in her studies and scientific writing by borrowing books from libraries on her behalf, soliciting information from other society members, either in person at meetings, or via letter correspondence, and liaising with her publisher during the production of her books [7]. Dr. Somerville

seems to have had no interest in mathematical research or in cultivating a reputation for himself as an eminent scientist. The importance of this disinterest was noted by geologist Charles Lyell in 1831 when he wrote the following:

> "had our friend Mrs. Somerville been married to La Place, or some mathematician, we should never have heard of her work. She would have merged it in her husband's, and passed it off as his." [3, p. 325]

While emphasising the role domestic partnerships have played in mathematical work, we should not neglect the converse influence that mathematical careers can exert on a given couple's way of building a life together. In his survey of collaboration of queer couples in the sciences, Opitz suggests that "the ethos of professional respectability claimed a significant role in shaping the dynamics of [queer] collaborative partnerships" [4]. That is to say, scientists curated an image of themselves and their relationships in order to conform with scientific practice of the time, whether that was as equal partners sharing expertise, or one partner being positioned as a researcher and the other as a domestic helpmate. This in turn affected the dynamics of the relationship itself, for example whether the partners desired or were able to achieve cohabitation. Moreover, the lived experience of a queer scientific couple was, and is, heavily influenced by social factors, such as the need to avoid harassment and discrimination in the workplace.

Paying attention to mathematicians' marriages also reveals ways that a mathematical career continues to be shaped and reimagined after an individual's death. After Bernhard Riemann's death, his widow Elise Riemann played an active role in the production of his *Collected Works*, while Emilie Weber helped buttress the friendship of Heinrich Weber and Richard Dedekind as they edited the publication. Similarly, Mary Everest Boole asserted quite an active voice in the commemoration of her husband, the logician George Boole, whom she survived by half a century. After his death she published prolifically on mathematical and logical pedagogy intertwined with religious issues, developing a mystical (and often mystifying) interpretation of George's work. In light of his well-documented reticence to speak publicly about his own religious beliefs, along with the temporal distance between his career as an author and hers, it is difficult to discern which of her ideas he shared. But whereas sexist dismissals of Mary's admittedly eccentric views were once common, scholarly consensus now rightly recognises her as a generally reliable witness to the more personal manifestations of George's thought. Today his contributions are better remembered through the lens of the information-theoretic interpretation developed by Claude Shannon in the mid-twentieth century. (Claude and his wife Betty Shannon, a computer at Bell Labs, offer another example of a mathematically collaborative marriage.) But Mary's efforts to shape the commemoration of George's legacy stand as an insightful body of work, offering a useful reminder that the meaning of a person's career is not fixed at the time of their death, and does not belong to the deceased alone.



Dear Sir
I send the Welsh maps of Bailli's writings on the History of Astronomy, which I shall be obliged by your presenting to Mrs Somerville with my respects and informing her that if either of them should be wanted here (the most unlikely thing in the world) I will inform her; that otherwise she is welcome to retain them as long as she pleases
Yours, Truly
A De Morgan
University
Tuesday

Figure 2. A letter from Augustus De Morgan to Dr. Somerville, sending Bailly's *History of Astronomy* for "Mrs Somerville". Bodleian Library, Somerville Collection, Dep. c. 370, MSD-3 126, reproduced courtesy of the Principal and Fellows of Somerville College.

The work of mathematics, past and present

Mathematical research — as the readers of the *Newsletter* will hardly need reminding — is work. When we understand the history of mathematics

as the history of a particular kind of work, it is clear that a full picture must include the related and interdependent kinds of labour that together form the context in which people make their lives as mathematicians. Such a historical perspective in turn compels us to recognise the seemingly mundane questions around various divisions of labour as meaningfully intrinsic to the work of mathematics in the present.

In suggesting marriages as a focal point, we certainly do not mean to overlook the many workers of diverse kinds who have not been part of a mathematical couple; this is just one line of historical inquiry among many. We call attention to it as a particularly illuminating one: given the feasibility of doing mathematics at home, and the paper-based practices so often constitutive of mathematical knowledge, studies of collaborative couples stand to offer much insight to the history of mathematics. Moreover, such studies naturally look beyond 'lone geniuses' and destabilise the history of mathematics as presented in university courses, namely as a body of knowledge steadily unearthed through the conjecturing and proving of theorems by the individuals after whom they are named.

To organise mathematical work in a particular way, to the advantage or disadvantage of particular people, has always been part of the making of mathematical careers. But the great diversity of ways this process has played out in the past illustrates the contingency of any given arrangement, and hence the possibility of re-imagining how collaboration, domesticity, and labour fit together in the mathematical community today.

To find out more...

We encourage readers to attend the forthcoming workshop *Marriages, Couples, and the Making of Mathematical Careers*, supported by the LMS and the British Society for the History of Mathematics, to be held online 29–30 April 2021.

For more details and free registration please visit mathmarriages.wordpress.com.

FURTHER READING

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[3] Mrs Lyell (ed), Life Letters and Journals of Sir Charles Lyell, Bart., Volume 1, John Murray: London, 1881.

[4] A. Lykknes, D. L. Opitz, B. Van Tiggelen (eds), For Better or For Worse? Collaborative Couples in the Sciences, Birkhäuser, 2012.

[5] K. R. Myers et al., Unequal Effects of the COVID-19 pandemic on scientists, Nature Human Behaviour, 2020. doi.org/10.1038/s41562-020-0921-y

[6] National Union of Students, Power in the Academy: Staff Sexual Misconduct in UK Higher Education, 2018. www.nusconnect.org.uk/resources/nus-staff-student-sexual-misconduct-report

[7] B. Stenhouse, Mister Mary Somerville: Husband and Secretary, The Mathematical Intelligencer, 2020. doi.org/10.1007/s00283-020-09998-6

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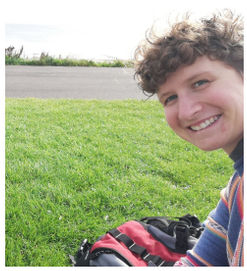

Brigitte Stenhouse

Brigitte Stenhouse is a PhD student in History of Mathematics at the Open University, UK. Her thesis looks at the work of Mary Somerville (1780–1872), and considers questions around translations; differential calculus in early-19th-century western Europe; and gendered access to knowledge. Her

favourite way to unwind is to go splashing in the sea with her five-year-old nephew — the colder the better!